Scoping magnetic fields out for prevention

July 11 2018

Credit: Springer

Concerns about the effects of magnetic fields on human health require careful monitoring of our exposure to them. Mandatory exposure limits have been defined for electric and hybrid vehicle architectures, in domestic and work environments, or simply to shelter sensitive devices from unintended sources of magnetic disturbance. In a new study published in *EPJ Plus*, physicists Jose Manuel Ferreira and Joaquim Anacleto from the Trás-os-Montes e Alto Douro University in Portugal develop a method for deriving an approximate value of the circulation around a loop of the magnetic field generated by the flow of electric current in an arbitrarily-shaped wire of a given length.

Magnetic fields are not only ubiquitous; they can also move around. For

example, each time an electric current passes through a wire, it generates a magnetic field that changes in tandem with the wire's shape. This was proven by the Danish physicist Hans Christian Ørsted in 1820. Subsequently, Jean-Marie Biot and Félix Savart gave their names to a law describing the magnetic field away from an electric current, which depends on the distance and orientation relative to the direction of current, and the strength of the current.

In this study, the authors set out to adapt Biot-Savart's law, which describes the magnetic field generated by finite wires, to evaluate the circulation of such fields around a closed path or loop. This led the authors to a mathematical formula that, as the finite wire thickness decreases to zero, becomes identical to one of their recent research results expressing the magnetic field circulation as a function of the wire current and of the solid angles between the circulation path and each of the conducting wire's endpoints.

The authors found that the circulation around a closed path of the magnetic field generated by a non-closed portion of circuit was identical to that resulting from the interchange of the portion of circuit with the closed path. The next step would be to produce simple approximations of the magnetic fields generated by a variety of finite-length conductors of various shapes.

More information: J. M. Ferreira et al, The magnetic field circulation counterpart to Biot-Savart's law, *The European Physical Journal Plus* (2018). DOI: 10.1140/epjp/i2018-12097-7

Provided by Springer

Citation: Scoping magnetic fields out for prevention (2018, July 11) retrieved 19 September

2024 from https://phys.org/news/2018-07-scoping-magnetic-fields.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.